

9.0 SUMMARY OF ECOLOGICAL RISK ASSESSMENTS

Menzie-Cura & Associates performed two ERAs for Sauget Area 1 (Menzie-Cura & Associates, 2001; 2002). The 2001 ERA focused on floodplain soils, surface water, and sediments associated with Creek Segment F, including Borrow Pit Lake, and floodplain soils associated with upstream segments of Dead Creek and the disposal areas. Terrestrial receptors (plants, invertebrates, birds, and mammals) were evaluated within the floodplain soils and aquatic receptors (plants, invertebrates, fish, birds, and mammals) were evaluated within Dead Creek and Borrow Pit Lake.

Solutia excavated 46,000 cubic yards of sediments from Creek Segments B, C, D, E and F in 2001/2002. Following sediment removal efforts in 2001/2002, the 2002 ERA was conducted to evaluate potential impacts to fish and aquatic wildlife due to exposure to residual constituent concentrations in creek bottom soils. The 2002 ERA also included the development of site-specific, risk-based concentrations (RBCs) for protection of fish in Dead Creek. By agreement with USEPA, RBCs were developed for residual concentrations of known bioaccumulative compounds (Total DDT, Dieldrin, gamma-Chlordane, Total PCBs, Dioxin TEQ and Mercury), Bis(2-ethylhexyl)phthalate and site-specific metals (Copper, Lead and Zinc). To achieve these RBCs within the creek, additional remediation was conducted in 2005/2006 that included the removal of 12,400 cubic yards of creek bottom soils from Segments B, D, E, and F and sediments from Borrow Pit Lake.

Following the sediment removal efforts and the de-watering of portions of Dead Creek, ENSR updated the 2001 floodplain soil terrestrial evaluation and conducted a terrestrial evaluation of the de-watered creek bottom soils of Segments C, D, and E (ENSR, 2009). Since these creek segments were de-watered to protect public health (mosquito control) they no longer provide aquatic habitat, but could be considered terrestrial habitat for plants, soil invertebrates, and terrestrial wildlife. Terrestrial organism screening was not performed for Creek Segment B, Creek Segment F, and Borrow Pit Lake, because an armored, HDPE liner was installed in Creek Segment B (completed in December 2008) and Creek Segment F and Borrow Pit Lake are aquatic habitats that were remediated to site-specific, risk-based concentrations in 2005/2006.

The floodplain data set evaluated in the 2001 and 2009 terrestrial evaluations represents samples collected from upland areas which drain into Dead Creek Segments B, C, D, and E and could be subject to flooding during periods of high water flow. Segment A was remediated under Illinois EPA oversight in the early 1990's by removing sediments and filling this portion of the creek with clean soil. Segment A of Dead Creek was eliminated at that time and the former creek area is now used as a truck parking lot by a local industry. Therefore, floodplain soils were not collected from this area. Towards the end of Segment E, the creek flows into a culvert consisting of a 48 inch corrugated pipe which runs under the old Parks Airport College and eventually discharges just north of Route 157. As the creek flows under Route 157 and becomes Segment F, it becomes a small, shallow ditch. It is expected that, if flooding were to occur, it would occur prior to the culvert and north of Route 157. Since flooding is not expected within Segment F, floodplain soils were not collected from adjacent to this segment.

A summary of the ERA activities is provided below:

Study Area	Receptors Evaluated	Summary of Results
Creek Segment A	No ERA activities conducted	Approximately 27,500 tons of sediments were excavated by Cerro Flow Products in 1990/1991. After installation of an HDPE vapor barrier, Creek Segment A was backfilled and covered with crushed gravel.
Creek Segment B	Warmwater fish ⁽²⁾ Aquatic wildlife ⁽²⁾	Sediments excavated in 2001/2002. Creek bottom soils did not present a risk to river otter or great blue heron. Minimal risks identified for forage fish (zinc and PCBs). Creek bottom soils excavated in 2005/2006 to meet RBCs derived for forage fish. No further evaluation warranted since concentrations were below RBCs and armored, HDPE liner has been installed.
Creek Segment C	Warmwater fish ⁽²⁾ Aquatic wildlife ⁽²⁾ Terrestrial plants ⁽³⁾ Terrestrial invertebrates ⁽³⁾ Birds ⁽³⁾ Mammals ⁽³⁾	Sediments excavated in 2001/2002. Creek bottom soils did not present a risk to river otter or great blue heron. Minimal risks identified for forage fish (aluminum – consistent with regional levels so not Site-related). Creek bottom soils not excavated in 2005/2006 since concentrations were not elevated relative to forage fish RBCs. After de-watering, data were evaluated against soil screening values. Concentrations of most constituents were below screening values and/or background. Maximum exposure point concentrations (EPCs) of six inorganic constituents were elevated above soil screening values and background. Additional evaluation/remedial action is not recommended since physical creek conditions limit the available habitat and represent substantial stressors for ecological receptors.
Creek Segment D	Warmwater fish ⁽²⁾ Aquatic wildlife ⁽²⁾ Terrestrial plants ⁽³⁾ Terrestrial invertebrates ⁽³⁾ Birds ⁽³⁾ Mammals ⁽³⁾	Sediments excavated in 2001/2002. Creek bottom soils did not present a risk to river otter or great blue heron. Minimal risks identified for forage fish (aluminum – consistent with regional levels so not Site-related). Creek bottom soils excavated in 2005/2006 to meet RBCs derived for forage fish. After de-watering, data were evaluated against soil screening values. Concentrations of most constituents were below screening values and/or background. Maximum EPCs of 12 inorganic and organic constituents were elevated above soil screening values and background. Post-excavation results are only available for a sub-set of constituents so there is some uncertainty regarding current concentrations of some constituents; however, they are expected to be lower than the evaluated data suggest. Additional evaluation/remedial action is not recommended since physical creek conditions limit the available habitat and represent substantial stressors for ecological receptors.

Study Area	Receptors Evaluated	Summary of Results
Creek Segment E	Warmwater fish ⁽²⁾ Aquatic wildlife ⁽²⁾ Terrestrial plants ⁽³⁾ Terrestrial invertebrates ⁽³⁾ Birds ⁽³⁾ Mammals ⁽³⁾	Sediments excavated in 2001/2002. Creek bottom soils did not present a risk to river otter or great blue heron. Minimal risks identified for forage fish (aluminum – consistent with regional levels so not Site-related). Creek bottom soils excavated in 2005/2006 to meet RBCs derived for forage fish. After de-watering, data were evaluated against soil screening values. Concentrations of most constituents were below screening values and/or background. Maximum EPCs of nine inorganic constituents were elevated above soil screening values and background. Post-excavation results are only available for a sub-set of constituents so there is some uncertainty regarding current concentrations of some constituents; however, they are expected to be lower than the evaluated data suggest. Additional evaluation/remedial action is not recommended since physical creek conditions limit the available habitat and represent substantial stressors for ecological receptors.
Creek Segment F and Borrow Pit Lake	Warmwater fish ^(1,2) Aquatic wildlife ^(1,2) Bald Eagles ⁽¹⁾	No risks to river otter or great blue heron in Segment F. Potential risks to benthic invertebrates, mallards, muskrats, and tree swallows due to exposure to Segment F sediments using conservative assumptions, Potential risks to benthic invertebrates, fish, river otter, great blue heron, mallards, muskrats, and tree swallows due to exposure to Borrow Pit Lake sediments using conservative assumptions, Sediments in Creek Segment F excavated in 2001/2002. Creek bottom soils did not present a risk to river otter or great blue heron. Minimal risks identified for forage fish (zinc). Creek bottom soils in Creek Segment F and sediments in Borrow Pit Lake excavated in 2005/2006 to meet RBCs derived for forage fish. No further evaluation warranted since post-excavation sampling confirmed concentrations were below RBCs.
Floodplains (adjacent to Creek Segments B, C, D, and E)	Terrestrial plants ^(1,3) Terrestrial invertebrates ^(1,3) Birds ^(1,3) Mammals ^(1,3)	Concentrations of most constituents were below screening values and/or background in 2001 and 2009 evaluations. Few concentrations exceeded both screening values and background concentrations. The scattered nature of the exceedances does not appear related to Dead Creek and is unlikely to result in significant risk to terrestrial receptors. No further evaluation/remedial action is warranted.

Notes:

- 1) Menzie-Cura & Associates, 2001
- 2) Menzie-Cura & Associates, 2002
- 3) ENSR, 2009

Constituent concentrations above terrestrial soil screening values and background levels exist in the 2009 terrestrial evaluation of creek bottom soils in Segments C, D, and E. However, the extent of these areas is more limited than the data suggest because sediment excavation efforts have removed many samples with exceedances, thus reducing the potential for risk to terrestrial receptors. Sediments were excavated from within portions Creek Segments D and E in 2005/2006 to achieve RBCs for the protection of fish. Although post-excavation sampling was only conducted for a limited set of constituents with RBCs, it is likely that these excavations reduced creek bottom soil concentrations of other constituents as well.

In addition, the need for further evaluation or remedial action should recognize that the creek is an actively maintained stormwater drainage ditch receiving runoff from a variety of developed properties. In several locations along the creek, drainage swales discharge runoff from properties including residential areas, a car wash, a junkyard, a restaurant, and several roadways. These discharges occur following rain events and the resulting increase in water flow may rapidly change conditions within the de-watered portions of the creek from dry to flooded until the water either drains or is pumped out. Depending on the duration of the rain event, water may remain in portions of the creek for several days at a time. This change in water regime (e.g., generally dry conditions with periods of standing water) limits the available habitat for terrestrial organisms and the presence of ecological receptors in the creek.

Although some exceedances of ecological screening values likely remain in certain areas after the completion of significant removal actions, the site-specific ecological evaluation does not indicate that additional remedial action alternatives should be considered within the creek. The use of Creek Segments C, D and E for stormwater conveyance from a variety of upland sources and the variable water level conditions within the creek result in an area that does not provide significant suitable habitat for terrestrial organisms. Since these conditions limit the available habitat and represent substantial stressors for ecological receptors, additional remedial action for the creek bottom soils is not recommended.

ENSR, 2009. Sauget Area 1 Update of Terrestrial Screening. Provided as Appendix 7 of the Ecological Risk Assessment Addendum prepared for Solutia Inc and submitted to USEPA on June 3, 2009.

Menzie-Cura & Associates, 2001. Ecological Risk Assessment for Sauget Area 1 Rev. 2: Report Prepared for Solutia Inc. and submitted to USEPA on June 30, 2001.

Menzie-Cura & Associates, 2002. Ecological Risk Assessment on Dead Creek Bottom Soil: Report prepared for Solutia Inc. and submitted to USEPA on June 21, 2002.